5. DETAILED GUIDANCE FOR THE RATING FORM

This chapter provides detailed guidance for answering the questions on the wetland rating form. The questions are listed in the order they appear on the form. Results from each section should be summarized in the spaces provided on the first page of the form.

5.1 WETLANDS NEEDING SPECIAL PROTECTION

Some wetlands may have characteristics, conditions, or values that are protected by laws or regulations in addition to the Critical Areas Ordinance or the State and Federal Clean Water Acts. Questions A1-A4 will help you identify whether the wetland being rated also needs to be protected using information that is outside the scope of this rating system.

<u>Questions SP1 - SP4.</u> Check List for Wetlands That Need Special Protection, and That Are Not Included in the Rating

SP1. *Has the wetland been documented as a habitat for any Federally listed Threatened or Endangered plant or animal species (T/E species)?*

For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database. Contact the Washington State Department of Fish and Wildlife for this information.

SP2. *Has the wetland been documented as habitat for any State listed Threatened or Endangered plant or animal species?*

For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Contact the Washington State Department of Fish and Wildlife or the Natural Heritage Program at the Department of Natural Resources for this information.

SP3. *Does the wetland contain individuals of Priority species listed by the WDFW for the state?*

The current list of priority species can be found on the state Fish and Wildlife Department web page. http://wdfw.wa.gov/hab/phspage.htm

There are 40 vertebrate species, 28 invertebrate species, and 14 species groups currently on the PHS List. These constitute about 16% of Washington's approximately 1000 vertebrate species and a fraction of the state's invertebrate fauna.

SP4. *Does the wetland have a local significance in addition to its functions*?

Local jurisdictions may have classified the wetland using criteria specific to the jurisdiction. For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.

5.2 CLASSIFYING THE WETLAND

Scientists have come to understand that wetlands can perform functions in different ways. The way wetlands function depends to a large degree on hydrologic and geomorphic conditions (Brinson 1993). Because of these differences among wetlands, a new way to group, or classify, them has been developed. This new classification system, called the Hydrogeomorphic (HGM) Classification, groups wetlands into categories based on the geomorphic and hydrologic characteristics that control many functions. This revision to the rating system incorporates the new system as part of the questionnaire for characterizing a wetland's functions.

The rating system uses only the highest grouping in the classification (i.e. wetland class). Wetland classes are based on geomorphic setting such as riverine or depressional. The more detailed methods for assessing wetland functions developed for eastern and western Washington (Hruby et al. 1999, Hruby et al. 2000) refine this classification and subdivide some of the classes further. The categorization of functions developed for this rating system, however, does not require this level of detail.

A classification key is provided with the rating form to help you identify whether the wetland is riverine, depressional, slope, lake-fringe, tidal fringe or flats. The key contains eight questions that need to be answered sequentially starting with first. The following section describes the criteria for identifying classes in more detail than found on the key.

<u>Question 1: Tidal Fringe Wetlands</u>

Tidal fringe wetlands are found along the coasts and in river mouths to the extent of tidal influence. The dominant source of water is from the ocean or river. The unifying characteristic of this class is the hydrodynamics. All tidal fringe wetlands have water flows dominated by tidal influences, and water depths controlled by tidal cycles in the adjacent ocean.

Tidal fringe wetlands in which the water has a salinity higher than 0.5 parts per thousand, are classified as "Estuarine" for the purposes of rating them. Tidal fringe wetlands in which the waters are tidal, but freshwater (salinities below 0.5 parts per thousand), are rated with riverine freshwater wetlands.

There are numerous tidal fringe wetlands in the estuaries and tidal sloughs in the Puget Sound region as well as in Willapa Bay and Grays Harbor. The difficulty is in identifying the boundary between fresh and brackish waters. In the absence of local information (e.g. the salt wedge in the Snohomish River extends upstream to the Route 2 bridge), the users of the rating system will have to rely on vegetation to identify the boundaries between fresh and salt water. Appendix B lists the sensitivity of common wetland plants to salt (from Hutchinson 1991). If the dominant plants in the community are those listed as "Tolerant" or "Very Tolerant," it can be assumed that the waters in the slough or river at that point are saline. If, on the other hand, most of the plants are in the list for "Very Sensitive" and "Sensitive," the assumption is that the wetland is a freshwater one.

Figure 10 shows Edison Slough which has a fringe of *Triglochin* sp. and *Carex lyngbyei* along the edge of the mudflat. On this basis the wetland was classified as "estuarine."

Figure 10: An estuarine slough at low tide with salt tolerant vegetation along the edges.

Question 2: Flats Wetlands

“Flats” wetlands occur in topographically flat areas that are hydrologically isolated from surrounding groundwater or surface water. The main source of water in these wetlands is precipitation directly on the wetland itself. They receive virtually no groundwater discharge or surface runoff from the surrounding landscape. This characteristic distinguishes them from depressional and slope wetlands.

Wetlands that should be classified as flats may be hard to distinguish from flat depressional wetlands that are fed by groundwater. This need not be a concern, however, for users of the rating system because both depressional and flats wetlands use the same questions in the rating form.

Question 3: Lake-fringe (Lacustrine-fringe) Wetlands

Lake-fringe wetlands are separated from other wetlands based on the area and depth of open water adjacent to them. If the area of open water next to a vegetated wetland is larger than 20 acres (8 hectares), and more than 6.6 feet deep (2m) over 30% of the open water areas, the wetland is considered to be “lake-fringe.” These criteria were developed as part of the project to assess wetland functions in western Washington (Hruby et al. 2000), and differ slightly from the criteria of lacustrine wetlands in the Cowardin classification (Cowardin et al. 1979). Figure 11 shows a lake-fringe wetland in Snohomish County with aquatic bed plants and a fringe of wetland shrubs.

Wetlands found along the shores of large reservoirs such as those found behind the dams along the major rivers are also considered to be lake-fringe. Although the area was once a river valley, the wetlands along the shores of the reservoirs function more like “lake” wetlands rather than “river” wetlands. The technical team revising the rating system decided to include wetlands along the shores of reservoirs as lake-fringe if they meet the thresholds for open water and depth.

Figure 11: Lake-fringe wetland with an area of aquatic bed vegetation and a narrow band of wetland shrubs along the shore.

Question 4: Slope Wetlands

Slope wetlands occur on hill or valley slopes where groundwater “daylights” and begins running along the surface, or immediately below the soil surface. Water in these wetlands flows only in one direction (down the slope) and the gradient is steep enough that the water is not impounded. The “downhill” side of the wetland is always the point of lowest elevation in the wetland. Figure 12 shows a slope wetland that formed where the slope of the hillside changed and caused groundwater to come to the surface.

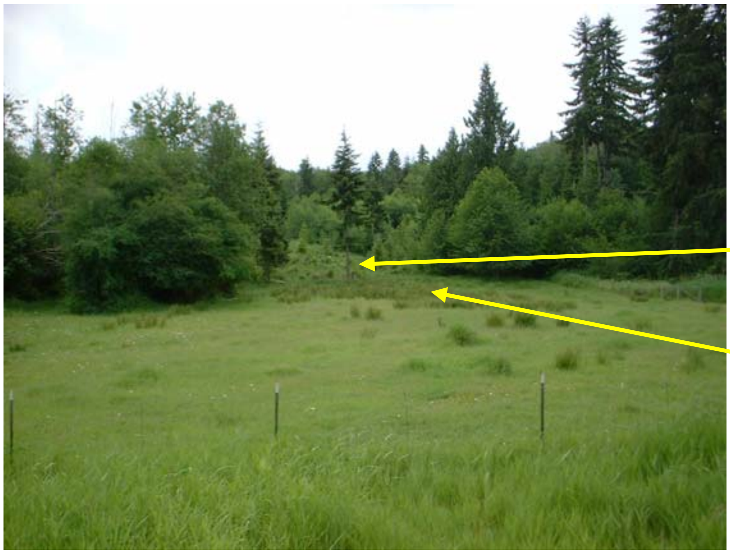


Figure 12: Slope wetland in Lewis County identified by the presence of wetland plants (*Carex sp*. *Juncus sp*.) Wetland occurs where there is a major break in this slope of the hillside.

Break in slope

Wetland plants

Slope wetlands are distinguished from riverine wetlands by the lack of a defined stream bed with banks that can overflow during floods or high water. Slope wetlands may develop small rivulets along the surface, but they serve only to convey water away from the wetland.

Question 5: Riverine Wetlands

Riverine wetlands occur in valleys associated with stream or river channels. They lie in the active floodplain of a river, and have important hydrologic links to the water dynamics of the river or stream. The distinguishing characteristic of riverine wetlands in Washington is that they are frequently flooded by overbank flow from the stream or river. The floodwater is a major environmental factor that structures the ecosystem in these wetlands. Riverine wetlands may also receive significant amounts of water from other sources such as groundwater and slope discharges. Wetlands, however, that lie in floodplains but are not frequently flooded are not classified as riverine.

Many riverine wetlands are associated with rivers that are very dynamic. Their proximity to the river facilitates the rapid transfer of floodwaters in and out of the wetland, and the import and export of sediments. Riverine wetlands are often replaced by depressional or slope wetlands near the headwaters of streams and rivers, where the channel (bed) and bank disappear, and overbank flooding grades into surface or groundwater inundation. In headwaters, the dominant source of water becomes surface runoff or groundwater seepage. For the purposes of classification, wetlands that show evidence of frequent overbank flooding, even if from an intermittent stream, are considered riverine.

Riverine wetlands normally merge with tidal fringe wetlands near the mouths of rivers. The interface with tidal fringe occurs where the dominant hydrodynamics change to tidal flows (Brinson et al 1995). This interface has been significantly modified in western Washington by diking. Many wetlands that were once freshwater tidal are now either riverine or depressional (depending on the frequency of flooding).

The operative characteristic of riverine wetlands in Washington is that of being "frequently flooded" by overbank flows (Figure 13).

Figure 13: A riverine wetland being inundated by flood waters from North Creek. The creek is in the background.

In western Washington the technical committees developing assessment methods decided that the frequency of overbank flooding needed to call a wetland "riverine" is at least once in two years (2 yr. "return" frequency). This characteristic, however, cannot be measured in the field and needs to be established from field indicators. The water regimes of wetlands in Washington have enough variability between dry and wet years that a frequency of flooding (e.g. flooded at least once every two years) could not be used. The following are some field indicators that are to be used to classify a wetland as riverine:

- Scour marks are common
- Recent sediment deposits
- Vegetation is bent in one direction or damaged
- Soils with layered deposits of sediment
- Flood marks on vegetation along the edge of the bank

Question 6: Depressional Wetlands

Depressional wetlands occur in depressions where elevations within the wetland are lower than in the surrounding landscape. The shapes of depressional wetlands vary, but in all cases, the movement of surface water and shallow subsurface water is toward the lowest point in the depression. The depression may have an outlet, but the lowest point in the wetland is somewhere within the boundary, not at the outlet.

Depressional wetlands can sometimes be hard to identify because the depression in which they are found are not very evident. By working through the key it may not be necessary to look at topographic maps, or try to identify that the lowest point of the wetland is in the middle. If a wetland has surface ponding, even if only for a short time, and is not lake-fringe, or riverine, it can be classified as depressional (Figure 14).

Figure 14: A category III depressional wetland. Note the surface ponding in the low point of the wetland with the cattails. This wetland functions relatively well to remove pollutants and store floodwaters, but does not provide much habitat.

Question 7: Flat Areas Maintained by High Groundwater

Many wetlands are found in the areas south and east of Olympia that have developed on the outwash plains left by the glaciers. These are maintained by high levels of groundwater in the region and do not easily fit into either the depressional, riverine, or flats class. These wetlands are fairly flat, are often ditched, and do not seem to have an identifiable natural outlet (Figure 15). If they pond water it is usually only because groundwater levels are high in the entire region and the water has nowhere to drain. These wetlands are classified as "depressional" for the purpose of rating them.

Figure 15: Wetland maintained by high levels of groundwater and is not in an easily identified topographic depression.

Question 8: Wetland Is Hard to Classify

Sometimes it is hard to determine if the wetland meets the criteria for a specific wetland class. You may find characteristics of several different hydrogeomorphic classes within one wetland boundary. For example, seeps at the base of a slope often grade into a riverine wetland, or a small stream within a depressional wetland has a zone of flooding along its sides that would be classified as riverine.

If you have a wetland with the characteristics of several HGM classes present within its boundaries use Table 2 to identify the appropriate class to use for rating. Use this table only if the area encompassed by the "recommended" class is at least 10% of the total area of wetland being rated. For example, if a slope wetland grades into a riverine wetland and the area of the riverine wetland is ¼ of the total wetland area, use the questions for riverine wetlands. However, if the area that would be classified as riverine is less than 10% (e.g. 0.5 acres out of a total wetland area of 10 acres) use the questions for the slope wetlands.

Table 2: Classification of wetlands with multiple hydrogeomorphic classes for the purpose of rating.

HGM Classes Within One Delineated Wetland Boundary	**Class to Use in Rating if area of this class > 10% total**
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal fringe and any other class of wetland	Treat as ESTUARINE under "wetlands with special characteristics"

If you are still unable to determine which of the above criteria apply to your wetland, or you have more than two HGM classes within a wetland boundary, classify the wetland as depressional for the rating. Complicated wetlands that have been found in western Washington during the calibration of the method have always had some features of depressional wetlands, and thus, could be classified as depressional.

5.3 CATEGORIZATION BASED ON FUNCTIONS

The functions that a wetland performs are characterized by answering a series of questions that note the presence, or absence, of certain indicators. Indicators are easily observed characteristics that are correlated with quantitative or qualitative observations of a function (Hruby et al. 2000). Most indicators are fixed characteristics that describe the structure of the ecosystem or its physical, chemical, and geologic properties (Brinson 1995). Indicators, unfortunately, cannot reflect actual rates at which functions are performed. Rather, they reflect the capacity and opportunity that a wetland has to perform functions (for a detailed discussion of the relationship between indicators and functions see Hruby 1999, Hruby et al. 2000).

The questions about the indicators of functions are grouped by the hydrogeomorphic class of the wetland being rated and then by the three major groups of functions wetlands perform (improving water quality, hydrologic functions, and wildlife habitat). The more detailed methods for assessing wetland functions in the lowlands of western Washington (Hruby et al. 1999), however, are divided into 15 different functions. The level of detail regarding functions found in these assessment methods, however, is not needed for the simpler categorization done in this rating system.

Much of the information about indicators used in the rating system is based on the seven methods for assessing wetland functions that have been developed in the state (Hruby et al. 1999, Hruby et al. 2000). The scores for the indicators used in this rating system were calibrated by using the information collected during the development of the methods in western Washington and during field visits by members of the review team. The rationale for choosing each indicator is given in a shaded box within the description of how to answer the field questions.

The three groups of functions (improving water quality, hydrologic functions, and wildlife habitat) are given approximately equal importance in setting the category for a wetland. Improving water quality and the hydrologic functions each have a maximum score of 32 points and the habitat functions a maximum score of 36 points out of a total of 100 points. The decision to give approximately equal weight to each group of functions is based on the fact that the laws and regulations regarding wetlands at the state and federal level don't specify that any function should be given more, or less importance, than another in protecting the wetland.

<u>5.3.1 Potential and Opportunity for Performing Functions</u>

One of the issues inherent in developing a characterization of functions is that the indicators used only represent structural characteristics of a wetland and its landscape. They do not measure rates at which functions are performed nor the ecological processes that control the functions. We are unable, for example, to actually measure the rate of sediment removal because we will probably not be present at the time sediments are coming into the wetland. A measurement of actual sediment removal would require monitoring the wetland during many times of the year and during several storms.

The scoring for each group of functions is divided into two parts to address our inability of measuring rates, processes, and habitat usage. One set of questions uses the structural characteristics in a wetland as indicators of the capability of performing a function. This is called the "Potential" for performing a function. The question we are trying to answer is: does the wetland have the necessary structures and conditions present within its boundaries to provide the function? For example, when characterizing how well a wetland can improve water quality we ask if the wetland has the vegetation to trap sediments and the right soils and chemistry to remove pollutants.

The second part in characterizing the function is called the "Opportunity." These questions characterize to what degree the wetland's position in the landscape will allow it to perform a specific function. For example, for functions called "improving water quality," we ask if there are sources of pollutants in the watershed that come into the wetland. Wetlands found in polluted watersheds have a higher opportunity to perform the function than those that have few if any pollutants in the surface or groundwater. A wetland in a pristine watershed will not remove many pollutants regardless of how capable it is of doing so because none are coming into the wetland.

Example of Differences in Potential and Opportunity Among Wetlands

We have defined the functions related to water quality improvement as "removing pollutants." Wetlands that remove more pollutants are considered to be more valuable and important than those that remove fewer pollutants. This general definition can be translated directly into pounds of pollutants removed per year.

It is not, however, possible to directly measure the amount of pollutants removed in a wetland in this method. In order to characterize the function we collect data on two different aspects of the function that we call potential and opportunity. The potential in this example is the maximum amount of pollutants a wetland can take up in a year given an unlimited amount of pollutants. The potential is based on the physical, biological, and chemical characteristics within the wetland itself. The opportunity in this example is the amount of pollutants actually entering the wetland, and is based on the characteristics of the landscape in which the wetland is found.

Consider two wetlands of equal size. The first wetland can remove a maximum of 20 lbs. of pollutants per year and the second can remove 100 lbs. per year. This is their potential. The first wetland has 100 lbs of pollutants coming into it (the opportunity) so it actually removes its maximum potential (20 lbs/year) but lets 80 lbs continue going downstream. The second wetland only has 5 lbs. of pollutants coming in. Though its potential is much higher than that of the first, it actually removes fewer pollutants (only 5 lbs/year), but it removes all pollutants coming in. The first wetland has a low potential but high opportunity and the second has a high potential with a low opportunity.

Opportunity and potential are both integral parts of wetland functions as we define functions. The key concepts in both state and federal clean water acts is to "maintain beneficial uses" and "preserve (and restore) biological integrity" of our waters. In the GMA (RCW 36.70A.172) it states that cities and counties need to "protect the functions and values of critical areas." The beneficial uses, or values, of wetlands in terms of functions is removing nutrients and reducing flooding. The other value of "biological integrity" is defined in terms of the habitat functions. This means that any characterization of functions needs to include both the potential and the opportunity aspects of the functions. For example, a wetland with good (undisturbed) connections to other wetlands or natural areas (i.e. with a high opportunity) will provide better habitat than the same wetland surrounded by a residential or urban area. In the latter case the habitat is not as suitable because many animals that would use the wetland do not have access to it.

The technical teams reviewing the rating system for the State decided to give equal weight to the “Potential” and “Opportunity” in the scoring of the functions. Such a weighting is a value judgment because we do not have any scientific data to indicate which is more important in the overall function in western Washington or among wetlands of different types. Other options might have been to give unequal weights to potential and opportunity (e.g. 75% of the score is potential and 25% is opportunity). From the Department of Ecology’s perspective the only fair division is to score opportunity and potential equally because we do not have information that would allow us to assign different levels of importance to these two factors of function.

The scoring on the data sheet is set up to reflect this decision. In the sections on the water quality and hydrologic functions there is one question asking whether the wetland has the opportunity to perform the function. If the wetland has the opportunity, its score for the indicators of “potential” is doubled. A more complex scaling of the score for opportunity of the water quality and hydrologic functions was considered, but had to be abandoned based on the experience gained in developing the 7 methods for assessing functions (Hruby et al. 1999, Hruby et al. 2000) and the two rating systems (east and west).

The first reason is that the teams developing the methods could not simplify the list of indicators for assessing the opportunity for most functions. For example, assessing the water quality functions in western Washington in more detail would have required more than 20 environmental indicators. Secondly, there was no consensus among the experts developing the methods in rating the opportunity of individual wetlands used for reference. For example, one reference wetland was observed to receive stormwater draining a residential area. The experts, however, could not agree if the opportunity to remove pollutants was high or moderate. Everyone agreed that it had some opportunity but there was no agreement on how much without taking extensive measurements during storms. Finally, it was difficult to obtain consistent results among users in measuring even a limited number of indicators for opportunity for the water quality and hydrologic functions.

The opportunity for a wetland to provide habitat is easier to characterize. There are four questions that reflect different types of opportunity and levels of opportunity. The scaling for these questions, however, has been set up so the total points possible are the same as the total for the structural indicators of habitat within the wetland itself (its potential).

Example of Scoring "Potential" and "Opportunity"

A wetland can score a maximum of 100 points on the questions related to functions (32 points for water quality improvement, 32 points for the hydrologic functions, and 36 points for habitat). The following table shows the results from two different wetlands. One wetland has the opportunity to perform the water quality and hydrologic functions while the other does not. Wetland B, however, has a better potential and opportunity to perform the habitat functions so the final scores are the same.

FUNCTION	Wetland A	Wetland B
Potential for Improving Water Quality	14	14
Opportunity for Improving Water Quality	Yes (score x 2)	No
TOTAL for Improving Water Quality	**28**	**14**
Potential for Decreasing Flooding and Erosion	6	12
Opportunity for Decreasing Flooding and Erosion	Yes (score x 2)	No
TOTAL for Decreasing Flooding and Erosion	**12**	**12**
Potential for Habitat	12	16
Opportunity for Habitat	8	18
TOTAL for Habitat	**20**	**34**
TOTAL score for all functions	**60**	**60**

5.3.2 Classifying Vegetation

There are several questions on the data sheet that ask you to classify the vegetation found within the wetland into different types. This should not be confused with classifying the wetland itself as described earlier. The classification of vegetation used for the rating system is mostly (with some exceptions noted in the field form) based on the "Cowardin" classification, and the criteria for these categories are adapted from Cowardin (1979). "Cowardin" vegetation types are distinguished by the uppermost layer of vegetation (forest, shrub, etc.) that provides more than 30% surface cover within the area of its distribution. If the total cover of vegetation is less than 30% the area does not have a vegetation type. It should be identified as open water or sand/mud flat.

A **forested area** is one where the canopy woody vegetation over 20 ft. (6 m) tall (such as cottonwood, aspen, cedar, etc.) covers at least 30% of the ground. Trees need to be partially rooted in the wetland in order to be counted towards the estimates of cover (unless you are in a mosaic of small wetlands as defined on p. 15). Some small wetlands may have a canopy but the trees are not rooted within the wetland. In this case the wetland does not have a forested class.

A **shrubby area** (scrub/shrub) in a wetland is one where woody vegetation less than 20 ft. (6 m) tall is the top layer of vegetation. To count, the shrub vegetation must provide at least 30% cover and be the uppermost layer. Examples of common shrubs in western Washington wetlands include the native rose, young alder, young cottonwoods, hardhack (*Spiraea)*, willows, and red-osier dogwood.

An area of "emergent plants" in a wetland is one covered by erect, rooted herbaceous plants excluding mosses and lichens. These plants have stalks that will support the plant vertically in the absence of surface water during the growing season. This vegetation is present for most of the growing season in most years. To count, the emergent vegetation must provide at least 30% cover of the ground and be the upper-most layer. Cattails and bulrushes are good examples of plants in the “emergent” plant type.

Herbaceous plants are defined as seed-producing species that do not develop persistent woody tissue (stems and branches). Most species die back at the end of the growing season.

An area of aquatic bed plants is any area where rooted aquatic plants such as lily pads, pondweed, etc. cover more than 30% of the “pond” bottom. These plants grow principally on or below the surface of the water for most of the growing season in most years. This is in contrast to the “emergent” plants described above that have stems and leaves that extend above the water most of the time. Aquatic bed plants are found only in areas where there is seasonal or permanent ponding or inundation. *Lemna sp.* (duckweed) is not considered an aquatic bed species because it is not rooted. Aquatic bed vegetation does not always reach the surface and care must be taken to look into the water.

Sometimes it is difficult to determine if a plant found in the water is “aquatic bed” or “emergent.” A simple criterion to separate emergent and aquatic bed plants most of the time is--If the stalk will support the plant vertically in the absence of water, it is emergent. If, however, the stalk is not strong enough to support the plant when water is removed, it is aquatic bed.

Examples of how different areas might be classified are given below.

- An area (polygon) of trees within the wetland boundary having a 50% cover of trees and with an understory of shrubs that have a 60% cover would be classified as a “forest.” The trees are the highest layer of vegetation and meet the minimum requirement of 30% cover.
- An area with 20% cover of trees overlying a shrub layer with 60% cover would be classified as a “shrub.” The trees do not meet the requirement for minimum cover.
- An area where trees or shrubs each cover less than 30%, but together have a cover greater than 30% is classified as “shrub.”
- When trees and shrubs together cover less than 30% of an area, the zone is assigned to the dominant plant type below the shrub (e.g. emergent, aquatic bed, mosses and lichens) if these have greater than 30% cover.

You are asked to characterize the vegetation types in terms of how much area within the wetland is covered by a type. <u>The thresholds for scoring differ among the questions so use caution in filling out the rating form.</u>

To complete the next part of the rating form you will first need to classify the wetland into one of the hydrogeomorphic classes. Answer only the question that pertains to the HGM class of the wetland being rated. The first letter of the question on the rating form identifies the wetland class for which the question is intended :

D = Depressional of Flats, R = Riverine or Freshwater Tidal Fringe, L = Lake-fringe, S = Slope.

The guidance below is divided into sections according to the HGM class of the wetland being rated. Each question on the rating form is addressed in turn.

5.3.3 Questions Starting with "D" (for Depressional or Flats Wetlands)

Water Quality and Hydrologic Functions of Wetlands in the Depressional or Flats Class

D 1.0 Does the Wetland have the Potential to Improve Water Quality?

D 1.1 *Characteristics of surface water outflows from the wetland*: (This indicator is used in both the water quality and the hydrologic functions.)

> **Rationale for indicator:** Pollutants that are in the form of particulates (e.g. sediment, or phosphorus that is bound to sediment) will be retained in a wetland with no outlet. Wetlands with no outlet are, therefore, are scored the highest for this indicator. An outlet that flows only seasonally is usually better at trapping particulates than one that is flowing all the time because there is no chance for a downstream release of particulates for most of the year (a review of the scientific literature on the "trapping" potential of wetlands is found in Adamus et. al. 1991).

As you walk around the edge of the depressional wetland note carefully if there are any indications that surface water leaves the wetland and flows further down-gradient. The question is relatively easy to answer if you find a channel.

You are asked to characterize the surface outlet in one of four ways for the scoring, and these are:

- Wetland has no surface water outlet - You find no evidence that water leaves the wetland on the surface. The wetland lies in a depression in which the water never goes above the edge (Figure 16).

Figure 16: A small depressional wetland with no outlet.

- Wetland has an intermittently flowing, or highly constricted, outlet. Intermittently flowing means that surface water flows out of the wetland during the “wet” season (seasonal outflow) or during heavy storms. Highly constricted outlets are those that are small or heavily incised, narrow channels anchored in steep slopes. In general, you will find marks of flooding or inundation three feet or more above the bottom of the outlet if the outlet is severely constricted. Another indicator of a severely constricted outlet is evidence of erosion of the down gradient side of the outlet.

- Wetland has an unconstricted or only slightly constricted outlet that allows water to flow out of the wetland across a wide distance. The outlet does not provide much hindrance to flood waters flowing through the wetland. In general, the distance between the low point of the outlet and average height of inundation will be less than three feet. Beaver dams are considered to be unconstricted unless they are anchored to a steep bank on either side. In general, they do not hold back flood-waters because the water level is maintained at the crest of the dam.
- Wetland is flat and has no obvious outlet or the outlet is a ditch. This is a characteristic commonly found in the wetlands described on page 29. Flat, depressional, wetlands that are maintained by high groundwater often do not have an obvious outlet or they are drained by ditches. These wetlands generally do not collect much surface water from the surrounding uplands but rather are connected to groundwater.
- NOTE: If you cannot find an outlet, or do not have access to it, in the depressional wetland, assume it is severely constricted when rating it.

D 1.2 *The soil 2 inches below the surface is clay, organic, or smells anoxic (hydrogen sulfide or rotten eggs).*

Rationale for indicator: Clay soils, organic soils, and periods of anoxia in the soils are all good indicators that a wetland can remove a wide range of pollutants from surface water. The uptake of dissolved phosphorus and toxic compounds through adsorption to soil particles is highest when soils are high in clay or organic content (Mitsch and Gosselink 1993). Anoxic conditions (oxygen absent), on the other hand, are needed to remove nitrogen from the aquatic system. This process, called denitrification, is done by bacteria that live only in the absence of oxygen (Mitsch and Gosselink 1993).

To look at the soil, dig a small hole within the wetland boundary and pick a sample from the area that is about 2 inches below the surface. Usually it is best to sample the soil toward the middle of the wetland rather than at the edge. <u>Do not, however, sample the soil under areas of permanent ponding.</u> Avoid picking up any of the “duff” or recent plant material that lies on the surface. First smell the soil and determine if it has a smell of hydrogen sulfide (rotten eggs). If so you have answered the question. If the soil is not anoxic, determine if the soil is organic or clay. If you are unfamiliar with the methods for doing this, a key is provided in Appendix C.

D 1.3 *Characteristics of persistent vegetation (emergent, shrub, and/or forest classes):*

Rationale for indicator: Plants enhance sedimentation by acting like a filter, and cause sediment particles to drop to the wetland surface (for a review see Adamus et al. 1991). Plants in wetlands can take on different forms and structures. The intent of this question is to characterize how much of the wetland is covered with plants that persist throughout the year and provide a vertical structure to trap or filter out pollutants. It is assumed, however, that the effectiveness at trapping sediments and pollutants is severely reduced if the plants are grazed.

If you are familiar with the Cowardin classification of vegetation, you are looking for the areas that would be classified as "<u>Emergent</u>", "<u>Scrub/shrub</u>," or "<u>Forested</u>." These are all "persistent" types of vegetation; those species that normally remain standing at least until the beginning of the next growing season (Cowardin et al. 1979). If you need help in identifying these types of vegetation review the discussion on p. 34. Emergent plants do not have to be alive at the time of the site visit to qualify as persistent. The dead stalks of emergent species will provide a vertical structure to trap pollutants as well as live stalks.

You are asked to characterize the vegetation in terms of how much area within the wetland boundary is covered by persistent, ungrazed, vegetation. There are three size thresholds used to score this characteristic – more than 1/10 of the wetland area is covered in persistent vegetation; more than 1/2 is covered; or more than 95% of the area is covered. These thresholds can usually be estimated visually in small wetlands. Large wetlands, however, may require you to draw the area of persistent vegetation on a map or aerial photo before you can feel confident that your estimates are accurate. **NOTE: this question applies only to persistent vegetation that is not grazed or mowed** (or if grazed, the vegetation is taller than 6 inches).

An easy way to estimate the amount of persistent vegetation is to draw a small diagram of the wetland boundary and within it map the areas that are open water, covered with aquatic bed plants, mudflats or rock. Also include areas that are grazed because much of the vertical structure of wetland plants is removed when plants are grazed. The remaining area is then by default the area of persistent vegetation. Figure 17 shows a depressional wetland in which persistent vegetation is between 1/2 and 95% of the area of the wetland. The remainder is open water.

Figure 17: A depressional wetland in which persistent, ungrazed, vegetation cover between ½ and 95% of the area of the wetland.

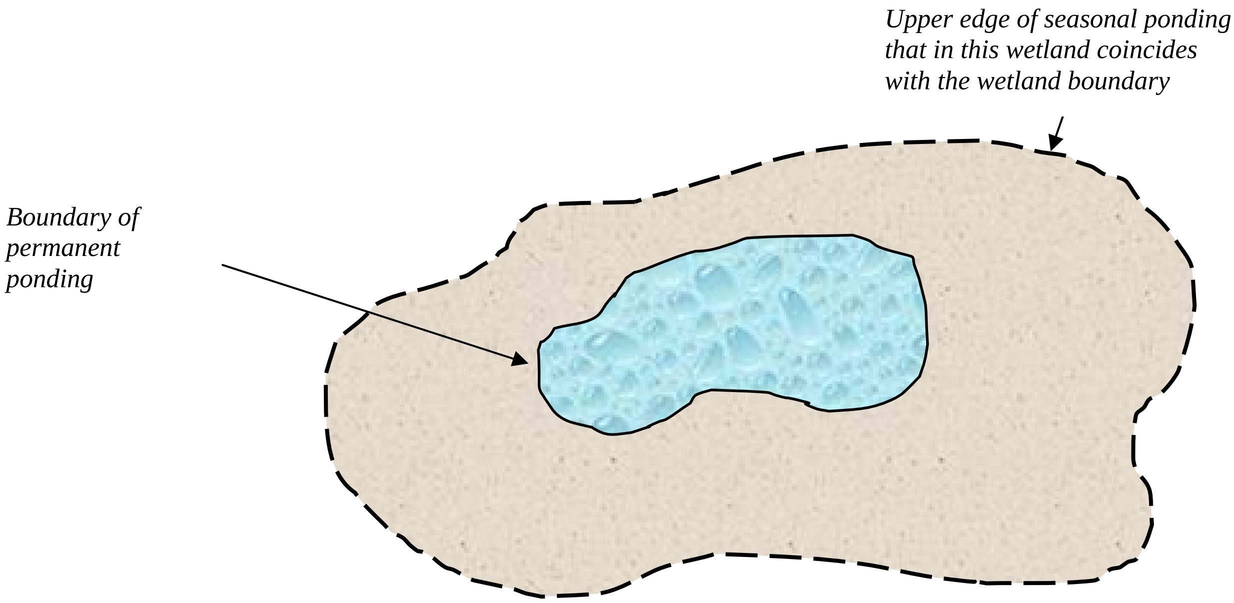
***D 1.4** Characteristics of seasonal ponding or inundation.*

Rationale for indicator: The area of the wetland that is seasonally ponded is an important characteristic in understanding how well it will remove nutrients, specifically nitrogen. The highest levels of nitrogen transformation occur in areas of the wetland that undergo a cyclic change between oxic (oxygen present) and anoxic (oxygen absent) conditions. The oxic regime is needed so certain types of bacteria will change nitrogen that is in the form of ammonium ion (NH_4^+) to nitrate, and the anoxic regime is needed for denitrification (changing nitrate to nitrogen gas) (Mitsch and Gosselink 1993). The area that is seasonally ponded is used as an indicator of the area in the wetland that undergoes this seasonal cycling. The soils are oxygenated when dry but become anoxic during the time they are flooded.

To answer this question you will need to estimate how much of the wetland is seasonally ponded with water. This is the area that gets flooded at some time of the year, the water remains on the surface for 2 months or more, and then it dries out again.

One way to estimate this area is to make a rough sketch of the wetland boundary, and on this diagram draw the outside edge of the area you believe has surface water during the wet season. If the wetland also has permanent surface water you will have to draw this and subtract it when making your estimate (see Figure 18).

Figure 18: Sketch showing the boundaries of areas that are seasonally ponded and permanently ponded. The answer to question D 1.4 for this wetland is that the area seasonally ponded is more than ½ the total area of the wetland.



During the dry season, the boundary of areas ponded for several months (*seasonal ponding*) will have to be estimated by using one or more of the following indicators.

- Marks on trees and shrubs of water/sediment/debris (Figure 19). The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.
- Water stained vegetation lying on wetland surface (grayish or blackish appearance of leaves on the surface).
- Dried algae left on the stems of emergent vegetation and shrubs and on the wetland surface (Figures 20, 21).

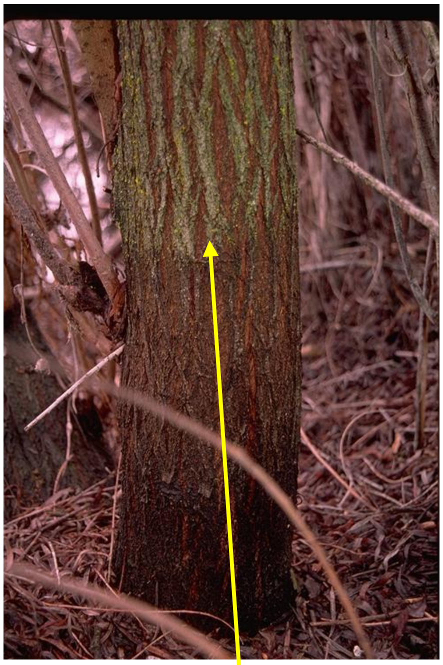


Figure 20: Small depressional wetland covered with algae. The edge of the algae marks the area that is seasonally ponded.

Figure 19: Water mark on tree showing vertical extent of seasonal ponding.

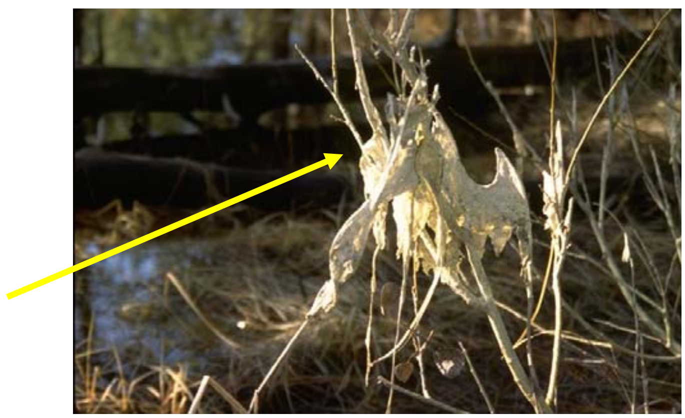


Figure 21: Algae left hanging on vegetation as wetland dried out. The top of the algae marks the vertical extent of seasonal ponding. The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.

NOTE: Avoid making visual estimates of area covered by seasonal ponding when standing at the wetland edge. These estimates are usually very inaccurate. A simple sketch, or a drawing of the boundary on an aerial photograph are much more accurate tools to use for estimating area.

D 2.0 Does the Depressional Wetland Have the Opportunity to Improve Water Quality?

Rationale for indicator: The opportunity for wetlands to improve water quality in a watershed is related to the amount of pollutants that come into the wetland. Qualitatively, the level of pollutants can be correlated with the level of disturbance, development, and intensity of agriculture in the landscape. For example, relatively undisturbed watersheds will carry much lower sediment and nutrient loads than those that have been impacted by development, agriculture, or logging practices (Hartmann et al. 1996, and Reinelt and Horner 1995). The opportunity that a wetland has to improve water quality is, therefore, linked to the amount of development, agriculture, or logging present in its immediate surroundings or in the up-gradient part of its contributing basin.

For the purpose of rating, it is assumed that a wetland has the opportunity to improve water quality if the amount of pollutants coming into the wetland as a result of human activities is higher than the pollutants (sediment and nutrients) that would be coming from natural causes. It is the removal of this excess pollution that is considered to be a valuable function for society.

Answer YES to the question if there are pollutants caused by human activities in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater down-gradient from the wetland.

Users of the rating system must make a qualitative judgment on the opportunity of the depressional wetland to actually improve water quality by asking the question. Are there any sediments, nutrients, toxic chemicals, or other pollutants coming into the wetland from human activities that can reduce water quality waters down-gradient from the wetland? Pollutants can come into a wetland both through groundwater and surface runoff.

A key to characterizing the opportunity for this group of functions is to consider the routing of runoff into and through a wetland. If adjacent areas lack evidence of surface runoff that enters the wetland, then few if any pollutants may be transferred to the wetland. Some systems of ditches that are found along the edges of wetlands route polluted runoff away from the wetland. If the wetland never floods then the pollutants have no chance to interact with the wetland. In these cases the wetland would not have the opportunity to improve water quality even though pollutants are introduced into the aquatic system in the vicinity of the wetland.

The question on the rating form lists several examples of conditions that result in pollutants reaching a wetland from human activities and therefore provide the opportunity for the wetland to improve water quality. You are asked to note which of the following conditions are present. These are common sources of pollutants.

- Grazing in the wetland or within 150ft. The issue here is nutrients coming into the wetland from animal droppings, from domesticated animals. The wetland has the opportunity to improve water quality if you can see recent droppings from domesticated animals, and you judge that nutrients and bacteria from these can be washed into the wetland.

- Untreated stormwater flows into the wetland. Stormwater is a source of sediment and toxic compounds.
- Tilled fields or orchards within 150 feet of wetland. Agriculture is a source of pesticides, nutrients, and sediments. The input of these pollutants to the wetland can be either by surface runoff or windblown dust.
- A stream or culvert brings water into wetland from developed areas, residential areas, farmed fields, roads, or areas that have been clear-cut within the last five years. Streams or culverts can bring in pollutants that are released outside the immediate area of the wetland. If you find a stream or culvert coming into the wetland, you will need to trace the course of the stream and determine if it passes through areas that can release pollutants.
- Land uses within 150 ft of the wetland that generate pollutants (residential areas having more than 1 house per acre, urban areas, commercial areas, and golf courses). These areas provide a potential source of pollutants from lawn care, driveways, pets, and parking lots.

The rating form has space to note potential sources of pollutants coming into the wetland not mentioned above. If you observe or know of other sources, note this on the form.

Note: Depressional wetlands that have no outlet (closed depression) may still have the opportunity to remove nutrients because they are usually connected to the groundwater system. Some pollutants such as nitrates and ammonia can be carried into the groundwater from surface runoff. Closed depressions, therefore, may provide a significant function by removing nitrates before they can get into the groundwater. Figure 15 shows a small depressional wetland in a heavily grazed pasture. This wetland has the opportunity to improve water quality before the water enters the groundwater.

Note: Highway infrastructure, both existing and proposed, include features that are designed to convey and treat water for water quality improvements and flow control. These features, including ditches, vegetated filter strips, stormwater ponds, infiltration basins, and other stormwater best management practices (BMPs), route water from and through a project area, and therefore must be understood to adequately make an “opportunity call” for wetlands located near the highway. If these systems are effective at blocking most nutrients and pollutants from getting into a wetland the wetland will **not** have the opportunity to perform these functions.

The data sheet gives the number of points a wetland should score for the indicators of potential. Add the scores for the indicators of potential and multiply by [1] or [2] depending on the “opportunity.” The total score should be carried forward to page 1 of the rating form.

D 3.0 Does the Depressional Wetland Have the <u>Potential</u> to Reduce Flooding and Stream Erosion?

D 3.1 *Characteristics of surface water outflows from the wetland:*

Rationale for indicator: Wetlands with no outflow are more likely to reduce flooding than those with outlets, and those with a constricted outlet will more likely reduce flooding than those with an unconstricted outlet (review in Adamus et al. 1991). In wetlands with no outflow all waters coming in are permanently stored and do not enter any streams or rivers. Constricted outlets will hold back flood waters and release them slowly to reduce flooding downstream.

See the description for question D 1.1. This question is answered the same way as question D 1.1. The difference between D 1.1 and D 3.1, however, is in the scores assigned each type of outflow. Differences in scores are based on the difference in importance of the outflow characteristics to the "water quality" functions and to the hydrologic functions.

D 3.2 *Depth of storage during wet periods (estimating "live storage"):*

Rationale for indicator: The amount of water a wetland stores is an important indicator of how well it functions to reduce flooding and erosion. Retention time of flood waters is increased as the volume of storage is increased for any given inflow (Fennessey et al. 1994). It is too difficult to estimate the actual amount of water stored for a rapid tool such as the rating system, and, therefore, we use an estimate of the maximum depth of the "live" storage as a surrogate. This is only an approximation because depressional wetlands may have slightly different shapes and therefore the volume of water they can store is not exactly correlated to the maximum depth of storage. The correlation, however, was judged to be close enough for the purposes of this rating system.

Live storage is a measure of the volume of storage available during major rainfall events that cause flooding in western Washington. This indicator recognizes that some wetlands, particularly those with groundwater connections, have water present all year around, or have some storage below the elevation of the outlet that does not contribute to reductions in peak flows (so called "dead storage"). In most depressional wetlands in western Washington the depressions have filled to the edge of the outlet by the time the peak flooding occurs (Hruby et al. 1999).

Locate the outlet of the wetland and identify the lowest point of the outlet (Figures 22, 23). In wetlands without outlets identify the deepest "hole" if the wetland is dry (Figure 24), or the level of the areas that are permanently flooded. Estimate the difference in elevation between these low points and the marks of seasonal inundation in D 1.4. This will provide an estimate of the depth of live-storage during the seasonal high water. Try to find water marks as close to the outlet, or low point, as possible so you can make visual estimates of the height from the outlet. Figures 22, 23 show water marks directly on the culverts. Estimate the difference in elevation between the lowest point of the outlet and the level at which you noted marks of inundation. There are four thresholds of concern: 1) more than 3 ft of storage, 2) between 2-3 ft of storage, 3) between 6 inches and 2 ft of storage, and 4) less than 6 inches of storage. These thresholds can usually be estimated without needing to use special equipment.

NOTE 1: If the outlet is a beaver dam or weir, treat the top of the dam or weir as the lowest point.   If water is flowing over the dam then the water surface anywhere in the wetland can be used to establish the low point.
NOTE 2: If the wetland has multiple outlets, try to find the one that has the lowest topographic elevation.
NOTE 3: Sometimes the lowest point of the outlet is flooded or flowing. In these cases, measure from the bottom of the outlet to the level of marks of average seasonal flooding. A common mistake is to measure from the current water level in the outlet to the marks of flooding.
NOTE 4: It can be difficult to extrapolate the height of flooding above the lowest point of the outlet in large wetlands where the flood marks are distant from the outlet.

Figure 22: A box culvert that is the outlet of a depressional wetland. The live-storage is measured as the distance between the bottom of the culvert and the water marks on the side. The distance is approximately 15 inches.

Water Marks of seasonal ponding (live storage)

Bottom of culvert

Figure 23: A round culvert with water still present. Measure the distance from the bottom of the culvert, not the present water level. The depth of storage is approximately 5 inches.

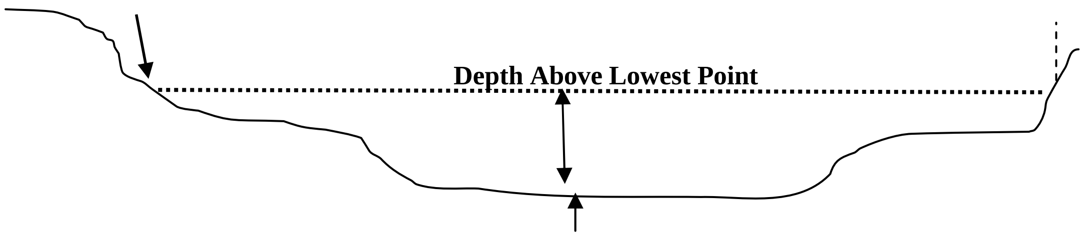


Figure 24 – Measuring maximum depth of seasonal ponding in a wetland without an outlet.

Headwater wetlands: This question also asks if the wetland being categorized is a "headwater" wetland. Depressional wetlands found in the headwaters of streams often do not store surface water to any great depth. They are however, important in reducing peak flows because they slow down and "desynchronize" the initial peak flows from a storm (Brassard et al. 2000). Their importance in hydrologic functions is often under-rated (statement of Michael L. Davis, Deputy Assistant of the Army, before the committee on Environment and Public Works, Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety, United State Senate, June 26, 1997). The depth of seasonal storage in headwater wetlands was judged to be an inadequate representation of the importance of these wetlands in the hydrologic functions. For this reason, headwater wetlands are scored 5 points, out of 7 possible, regardless of the depth of seasonal storage.

To identify if the wetland being rated is a "headwater" wetland, use the information collected in question D 1.1. If the wetland has a permanent or seasonal outflow but NO inflow from a permanent or seasonal stream, it is probably a "headwater" wetland for the purposes of this categorization. NOTE: One exception to this criterion is wetlands whose water regime is dominated by groundwater coming from irrigation practices. Depressional wetlands at the base of dams or edge of irrigation canals are not headwater wetlands, even if they have surface water that flows out of them without an inflow.

D 3.3 *Contribution of the wetland to storage in the watershed:*

> **Rationale for indicator**: The potential of a wetland to reduce peak flows from its contributing basin is a function of its retention time (volume coming into a unit during a storm event /the amount of storage present). The area of the contributing basin is used to estimate the relative amount of water entering it, while the area of the wetland is used to estimate the amount of storage present. Large contributing basins are expected to have larger volumes for any given storm event than smaller basins. Thus a small wetland with a large contributing basin is not expected to reduce peak flows as much as a large wetland with a small contributing basin.

This question asks you first to estimate the area of land that is found upstream of the wetland and that contributes surface water to the wetland. This is called the contributing basin or watershed to the wetland. You will then need to estimate the area of the wetland and calculate the ration of the two. You do not need to estimate these areas exactly because the scoring is based on thresholds for the ratio. If the contributing basin is less than 10 times the size of the wetland itself, the wetland will score the most points. On the other hand, if the area of the contributing basin is more than 100 times the area of the wetland the score is [0], and you will not need to make estimates.

D 4.0 Does the Depressional wetland Have the <u>Opportunity</u> to Reduce Flooding and Stream Erosion?

> **Rationale for the indicator**: The opportunity for wetlands to reduce the impacts of flooding and erosion is based on the presence of human or natural resources that can be damaged by these processes. The indicator used characterizes whether the wetland's position in the landscape protect downgradient resources flooding. We ask if there are resources in the watershed that can be damaged by flooding and erosion. These resources include both human and natural ones.

Answer YES if the wetland is in a position in the watershed where the flood storage, or reduction in water velocity, it provides can reduce damage to downstream property and aquatic resources.

One way to consider this question is to ask yourself, where would the surface water coming into a wetland go if the wetland were filled? The surface water that would have been stored in the wetland during storms has to go somewhere. If the surface water would runoff directly into a stream or river that has problems with flooding, then the storage provided by the wetland is important because it decreases the downstream flooding. In this case the wetland DOES have the opportunity. If, however, the water leaving the wetland is controlled in some way that prevents it from affecting flooding, the wetland does NOT have the opportunity. A USGS topographic map is a good tool to use to answer this question. The map will show buildings, bridges, or other structures in the floodplain of a river or stream. An aerial photograph can also be useful to identify resources that might be impacted by increases in surface flows.

The landscapes in western Washington are quite varied and it may be difficult to judge whether a wetland has the opportunity to perform hydrologic functions. The following points are provided as a guide to help you answer this question.

- Many depressional wetlands with no surface water outflow have the opportunity to perform the hydrologic functions because they are up-gradient of resources. They are actually performing the hydrologic functions at the highest levels possible. No surface water leaves the wetland to cause flooding or erosion. The water either infiltrates to groundwater or it evaporates. To answer the "opportunity" question for a wetland with no outflow, try to picture the wetland as "filled" with a parking lot. Where would the surface water it normally stores flow? If it would flow into a swale, channel, or stream, there is a possibility that the flow would increase flooding or erosion.
- When a wetland is situated upslope of a road where water movement through the road is limited by ineffective culverts, the roadway typically acts a levee, de-coupling upslope wetlands from the floodway. The road delays drainage from entering the floodway in a timeframe where it can contribute to peak flows. Also, the road prevents surface flows within the floodway from directly entering the wetland as they rise and using the storage capacity of wetlands that are upslope of the road. Wetlands upslope of a road **do not have** opportunity to provide hydrologic functions if the road impounds surface water near the rated wetland during flood events and keeps it impounded for some time after the flood recedes. This indicates that the hydrologic connection between the floodway and the upslope area is impaired. If, however, the water impounded on the upslope side of the road recedes at the same rate as a flooding event, you can assume the connections through the road are not constrained. In this case the storage provided by the wetland on the upslope side is important, and the wetland **does have** the opportunity.
- Wetlands that are situated at the base of a hillside, typically receive significant water inputs from groundwater. The rating system includes guidance that states wetlands that receive 90% of their hydrology from groundwater do not have the opportunity. Seep wetlands at the base of hills that are outside of the floodplain generally meet the intent of this criteria because of their landscape position. If the only hydrologic inputs that can be observed are from a spring/seep emerging from a hillslope, then the rated wetland likely does **not** have opportunity. If, however, there are indicators that the wetland receives surface runoff from further up the slope (e.g. small gullies, washes, etc.) as well as groundwater, then the wetland may have the opportunity if there are flooding problems further downstream.
- A depressional wetland that receives only return flow from irrigation also does **not** have the opportunity to perform the hydrologic functions. Since the

inflow is controlled, there is little chance that the water coming into the wetland will cause downstream flooding or erosion.

- A depressional wetland behind a dike in a river mouth does **not** have the opportunity because there are few resources further downstream that can be impacted by flooding, and the wetland is often disconnected from the floodplain.